

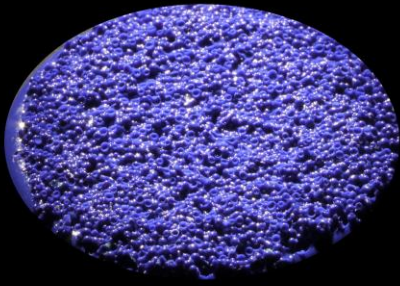
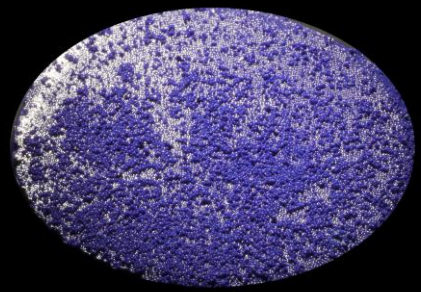
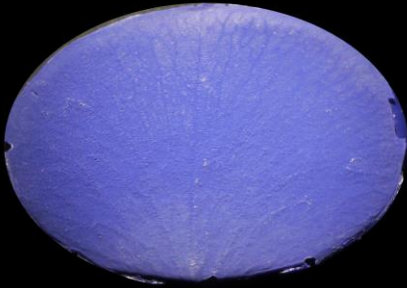
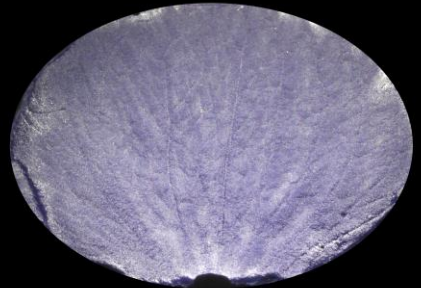
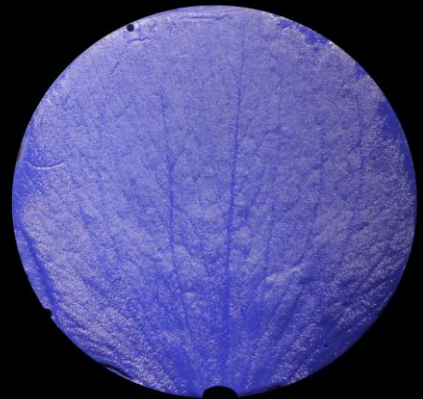
A**B****C****D****E****F**

Fig. S1: Artificial flowers: A) Rough glass photographed in an angle of 45° against spotlight. B) Fine glass photographed in an angle of 45° against spotlight. C) Conical *Tibouchina* petal photographed in an angle of 45° against spotlight. D) Smooth *Tibouchina* petal photographed in an angle of 45° against spotlight. E) Smooth Magnolia green leaf photographed in an angle of 45° against spotlight. F) Smooth *Tibouchina* petal photographed in an angle of 85° against spotlight.

Positional preferences

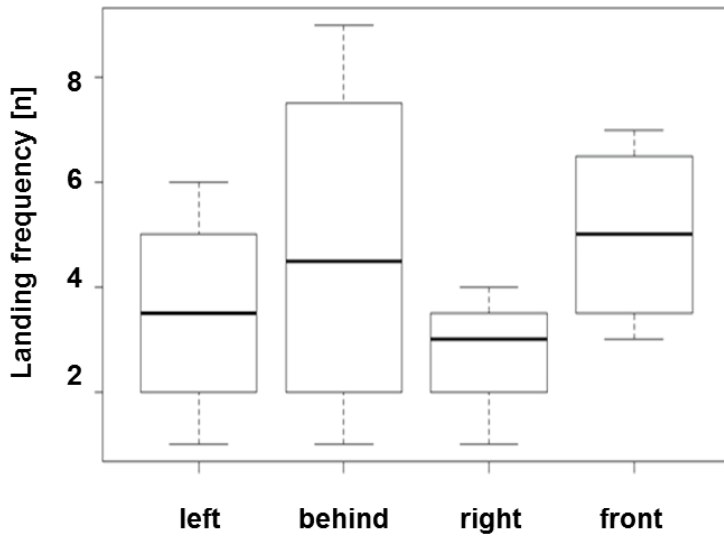


Fig. S2A: Landing frequency of *Bombus terrestris* at horizontally presented artificial flowers conical, rough, fine, smooth, under diffuse light conditions (ANOVA horizontally; $F(3, 12) = 0.837$; $p = 0.499$).

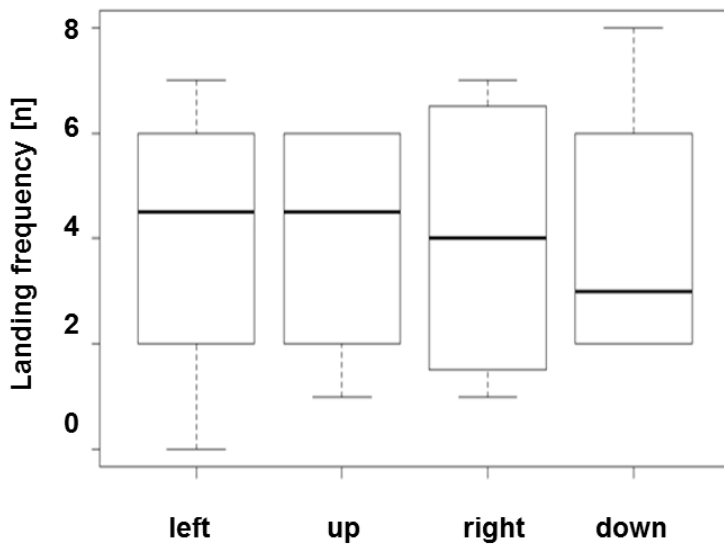


Fig. S2B: Landing frequency of *Bombus terrestris* at vertically presented artificial flowers conical, rough, fine, smooth, under diffuse light conditions (ANOVA vertically; $F(3, 12) = 0$; $p = 1.000$).

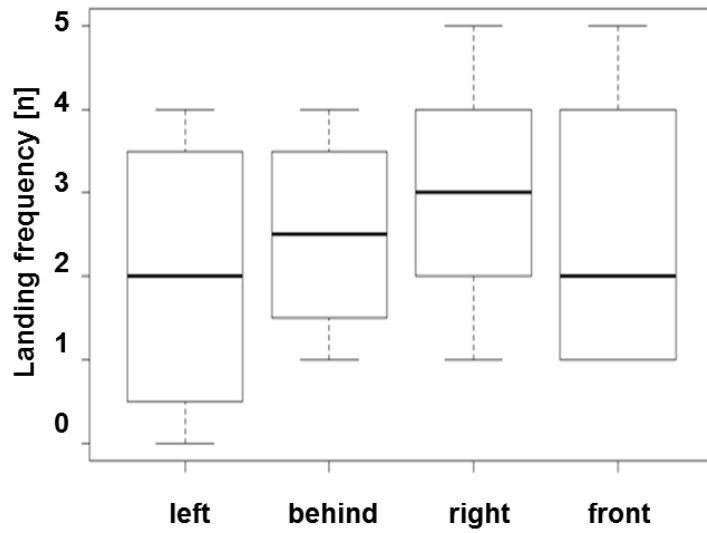


Fig. S2C: Landing frequency of *Bombus terrestris* at horizontally presented artificial flowers under spot light conditions when approaching against the direction of incident light (ANOVA_{against light}; $F_{(3, 12)} = 0.235$; $p = 0.870$).

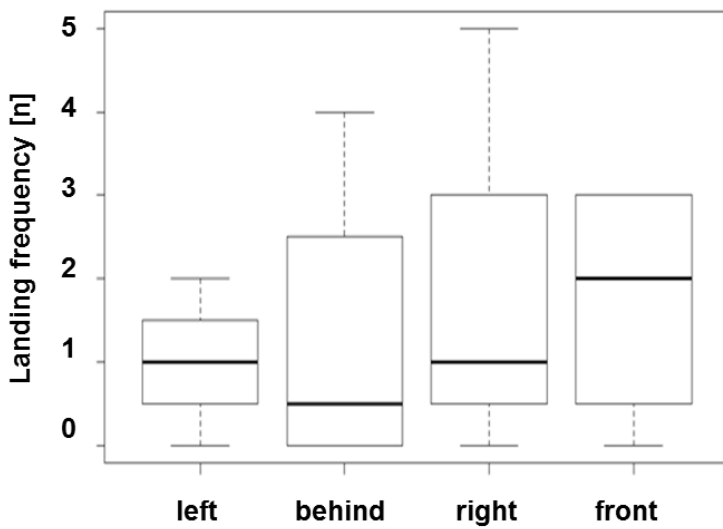


Fig. S2D: Landing frequency of *Bombus terrestris* at horizontally presented artificial flowers under spot light conditions when approaching in the direction of incident light (ANOVA_{in light}; $F_{(3, 12)} = 0.197$; $p = 0.896$).

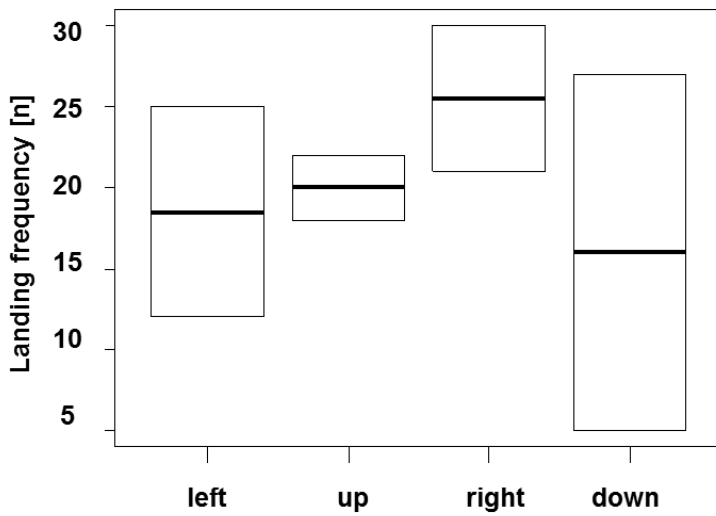


Fig. S2E: Landing frequency of *Bombus terrestris* at vertically presented artificial flowers Tconical, Tsmooth, Msmooth, under diffuse light conditions (ANOVA_{vertically}; $F_{(3, 4)} = 0.345$; $p = 0.796$).

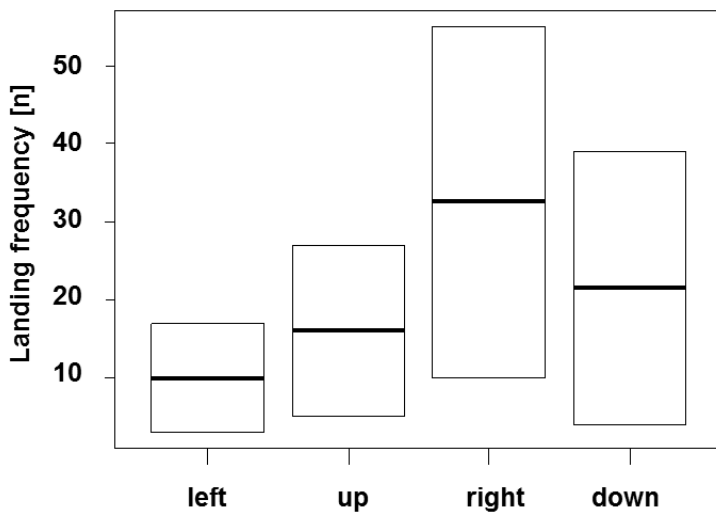


Fig. S2F: Landing frequency of *Bombus terrestris* at vertically presented artificial flowers Tconical, Tsmooth, Msmooth, under spot light conditions when approaching against the direction of incident light (ANOVA_{against light}; $F_{(3, 4)} = 0.373$; $p = 0.778$).

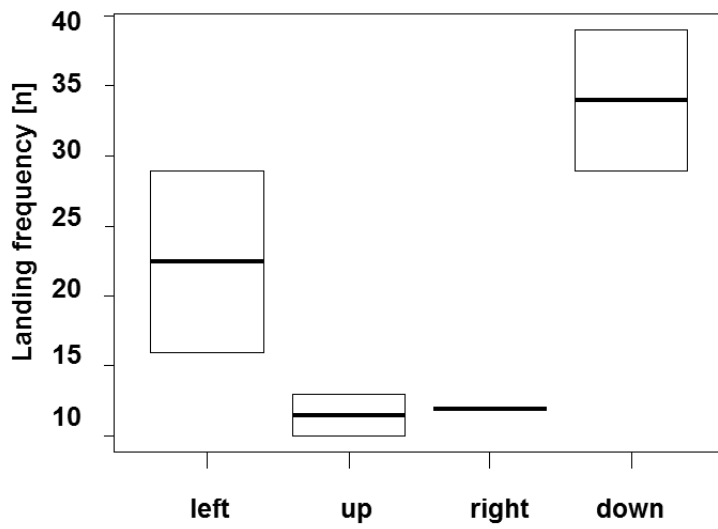


Fig. S2G: Landing frequency of *Bombus terrestris* at vertically presented artificial flowers Tconical, Tsmooth, Msmooth, under spot light conditions when approaching in the direction of incident light (ANOVA_{in light}; $F_{(3, 4)} = 6.494$; $p = 0.051$).

1st, 2nd 3rd, and 4th choices of bumblebee workers

This figure refers to Fig. 6 in the main text.

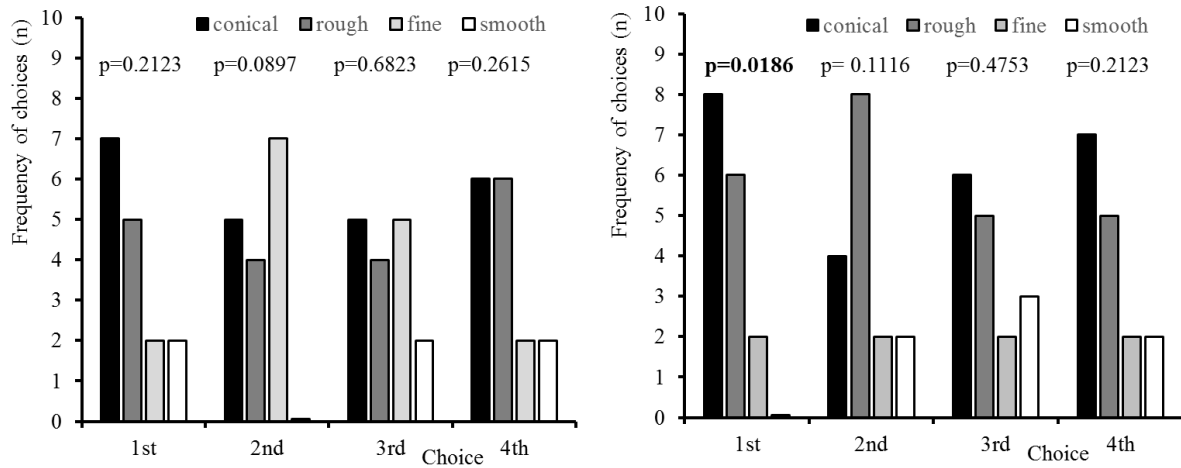


Fig. S3.1: Landing frequency of *Bombus terrestris* at horizontally (left) and vertically presented (right) artificial flowers under multidirectional light conditions. Each of 16 bumblebees contributed 4 choices in each test. Abbreviations for artificial flowers are as follows: conical = replica of rose petal; rough = microtexture produced by large glass pellets; fine = microtexture produced by small glass pellets; smooth = smooth surface. Statistics: P-values are given for the each choice (Qui-Square test).

This figure refers to Fig. 7 in the main text.

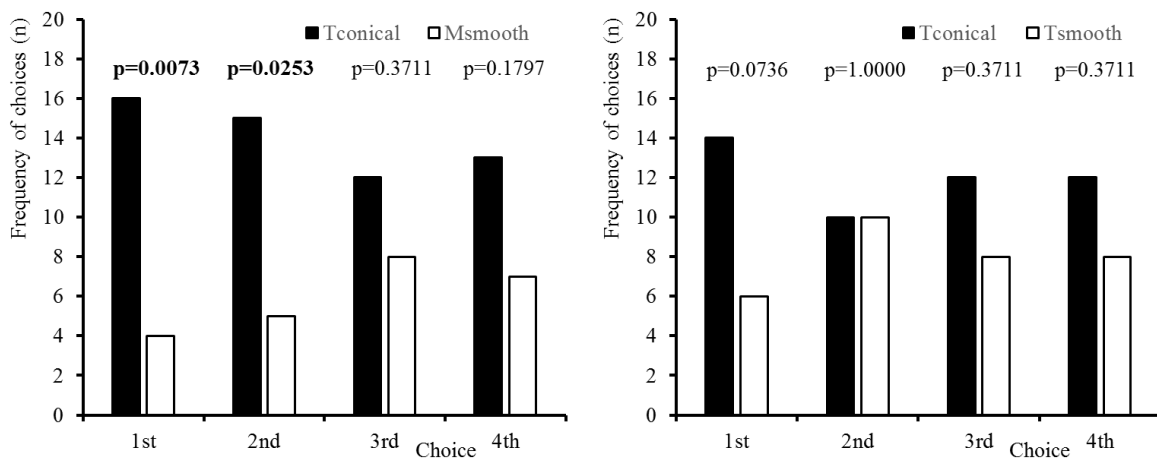


Fig. S3.2: Landing frequency of *Bombus terrestris* at vertically presented artificial flowers under multidirectional light conditions. Abbreviations: Tconical = conical microtexture of upper side of *Tibouchina urvilleana* petal; Tsmooth = smooth microtexture of underside side of *Tibouchina urvilleana* petal; Msmooth = smooth microtexture of upper side of *Magnolia grandiflora* green leaf. Each of 20 bumblebees contributed 4 choices in each test. Statistics: P-values are given for each choice (Qui-Square test).

This figure refers to Fig. 8 in the main text.

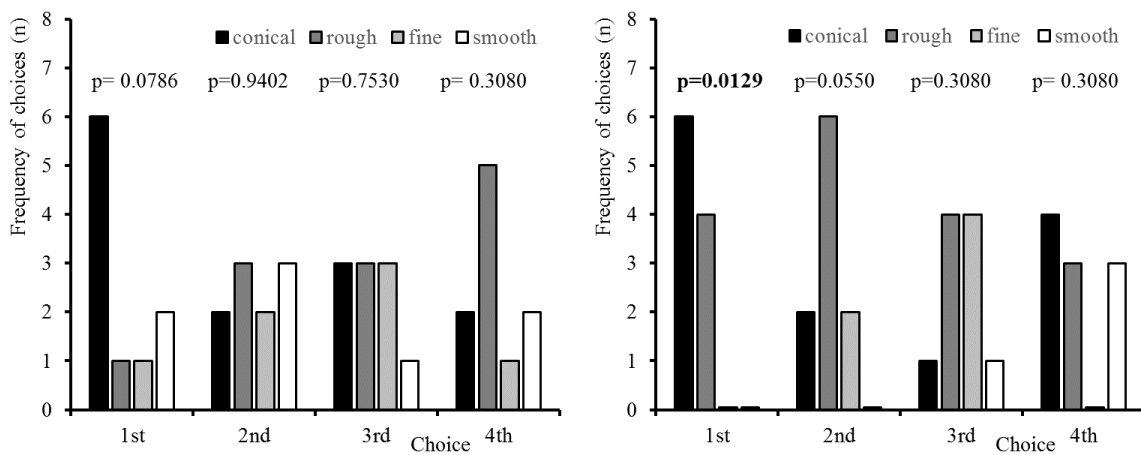


Fig.

S3.3: Landing frequency of *Bombus terrestris* at horizontally presented artificial flowers under spot light conditions when approaching (left) and against (right) the direction of incident light. Different letters over the bars indicate significant differences due to the Wilcoxon-Test without error correction. Each of 10 bumblebees contributed 4 choices in each test. Abbreviations for artificial flowers are as follows: conical = replica of rose petal; rough = microtexture produced by large glass pellets; fine = microtexture produced by small glass pellets; smooth = smooth surface. Statistics: P-values are given for each choice (Qui-Square test).

This figure refers to Fig. 9 in the main text.

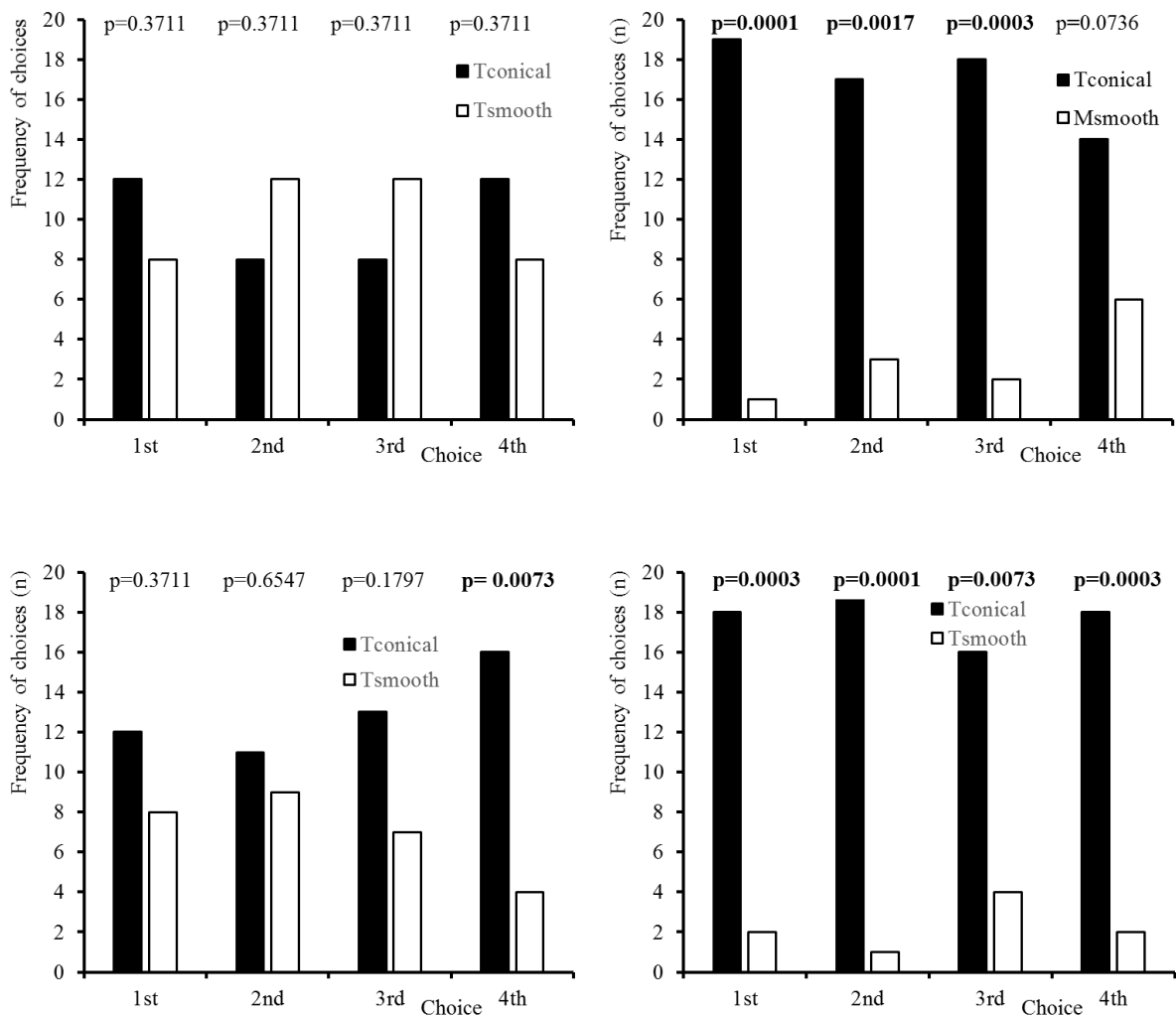
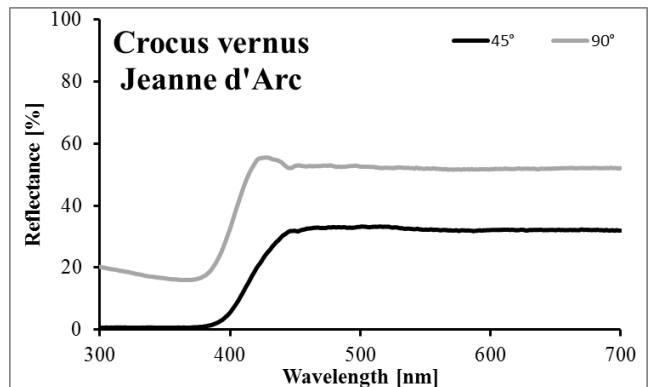
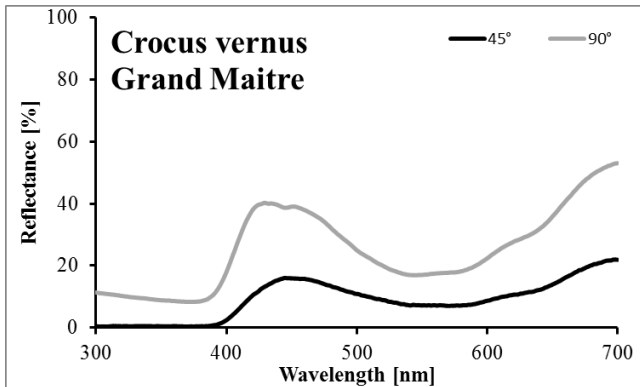
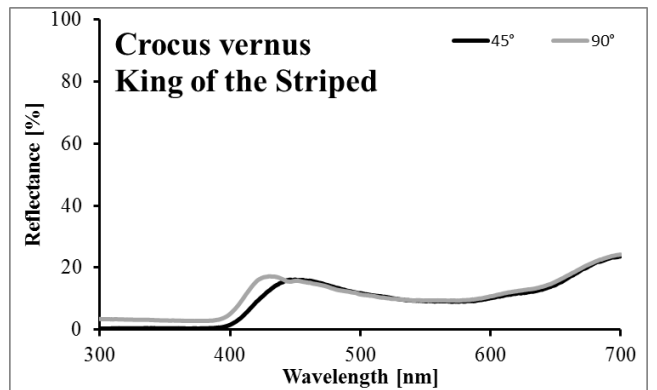
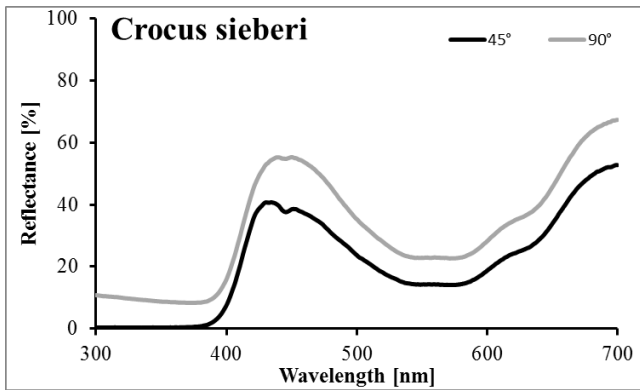
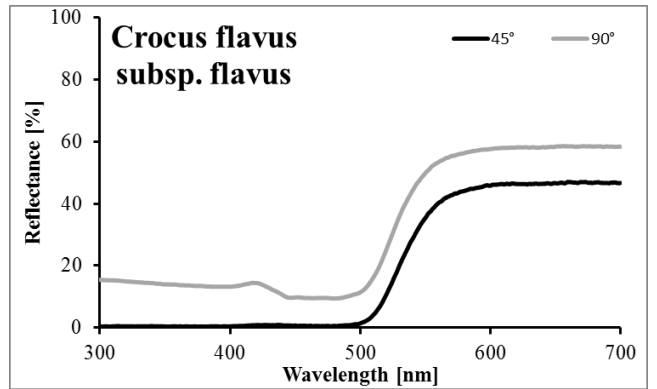
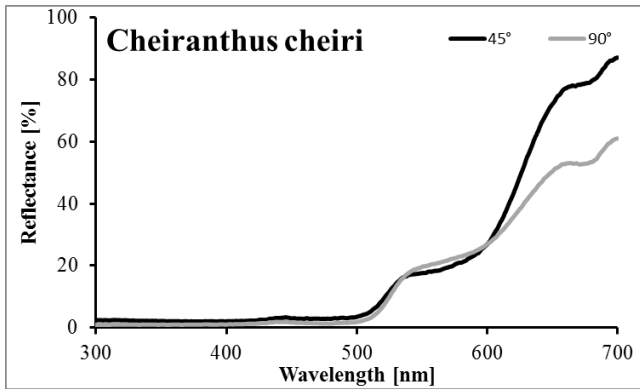
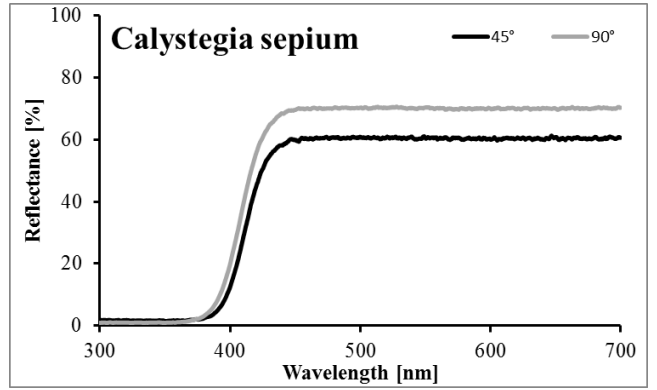
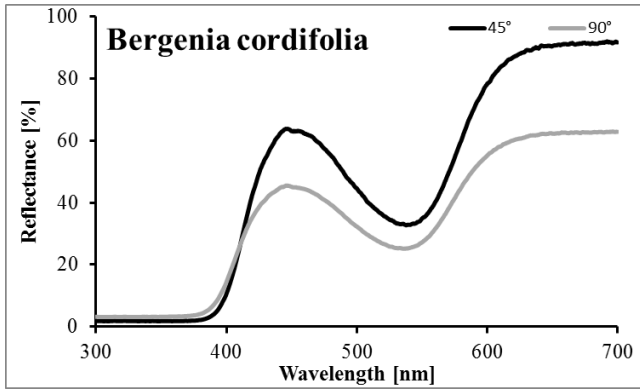
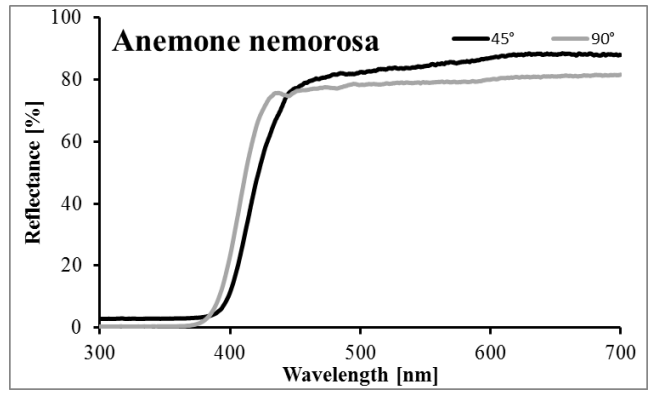
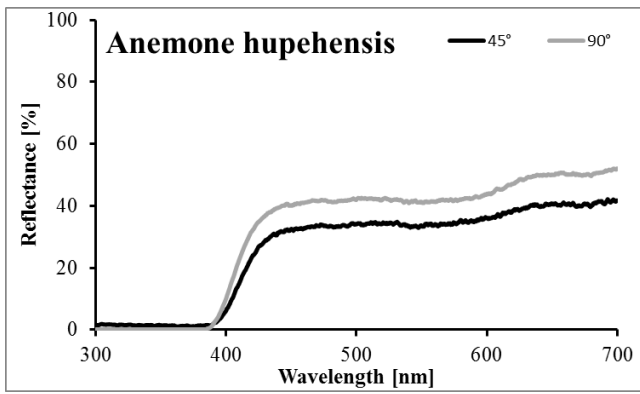
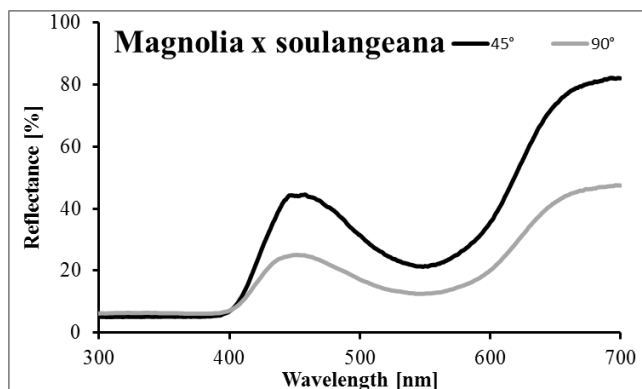
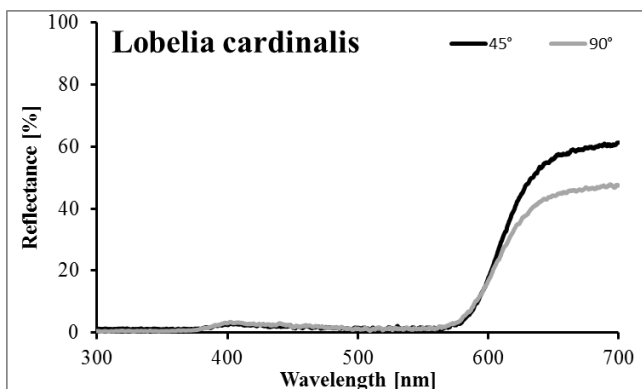
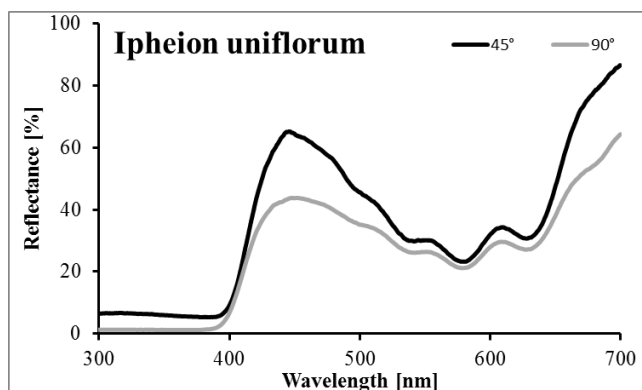
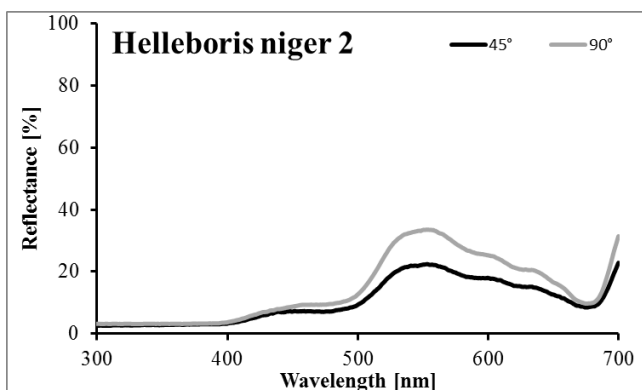
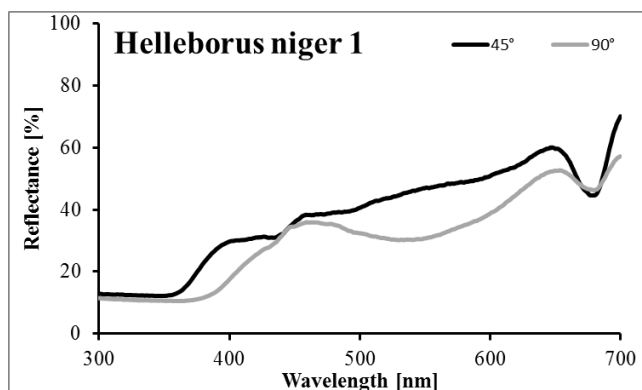
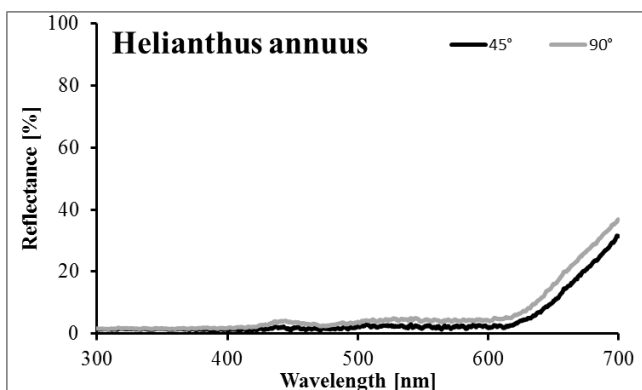
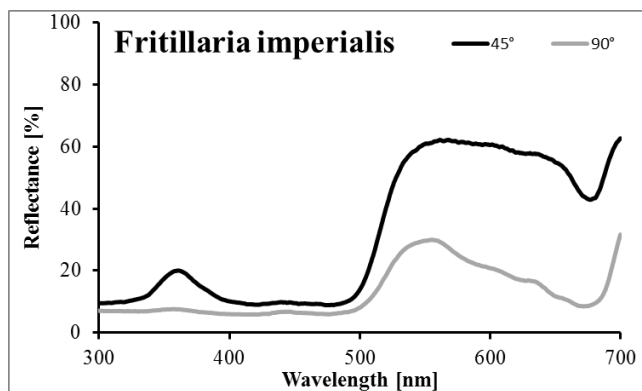
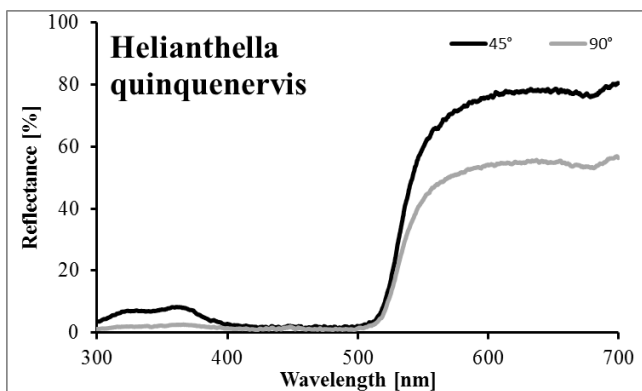
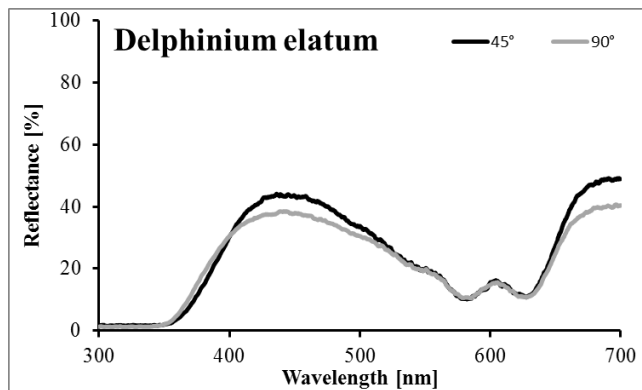
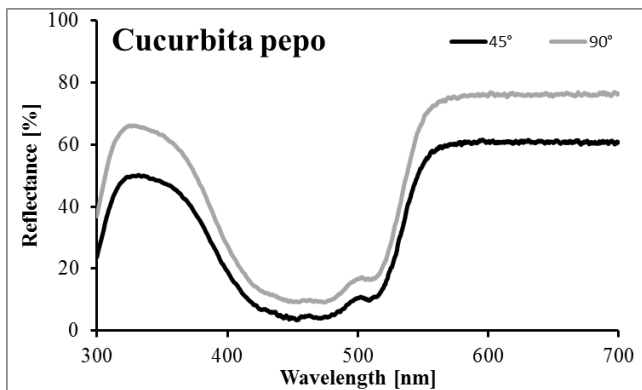
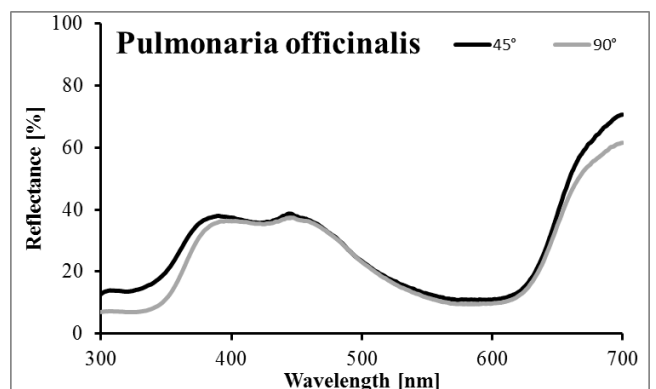
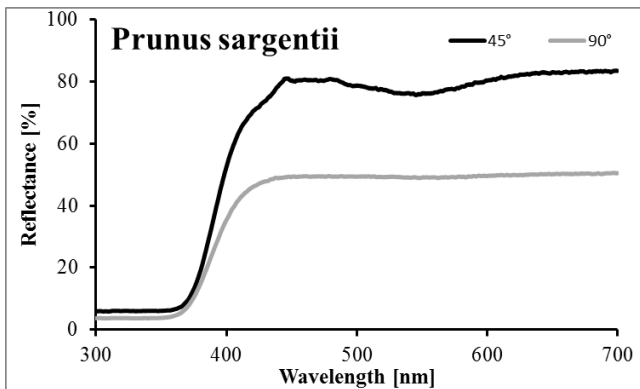
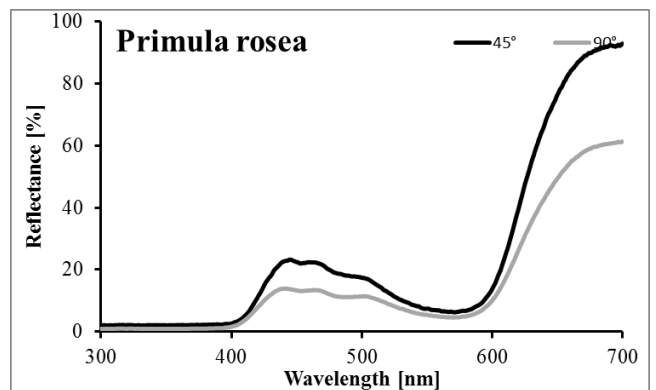
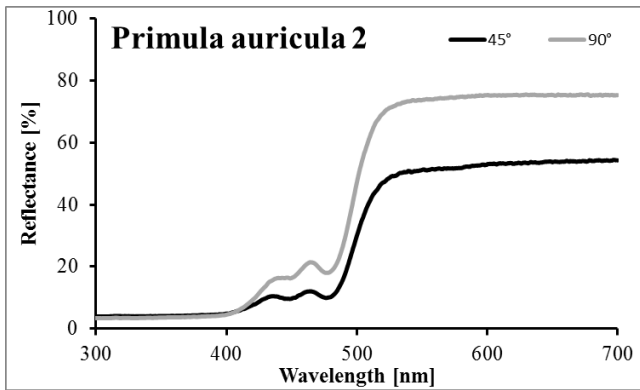
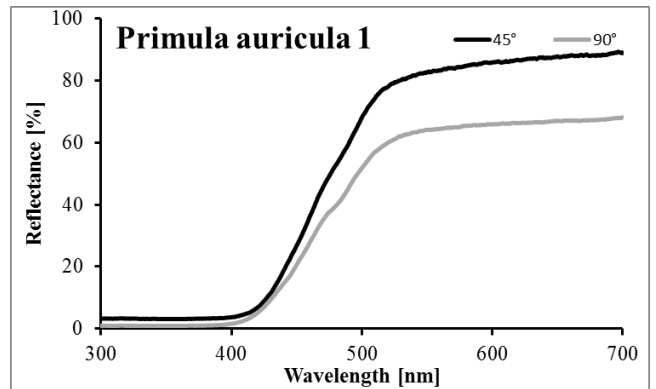
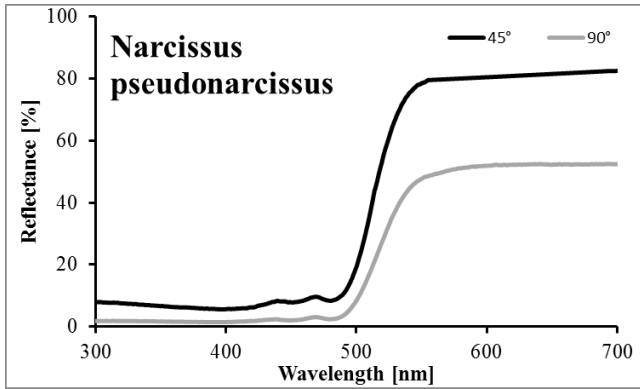
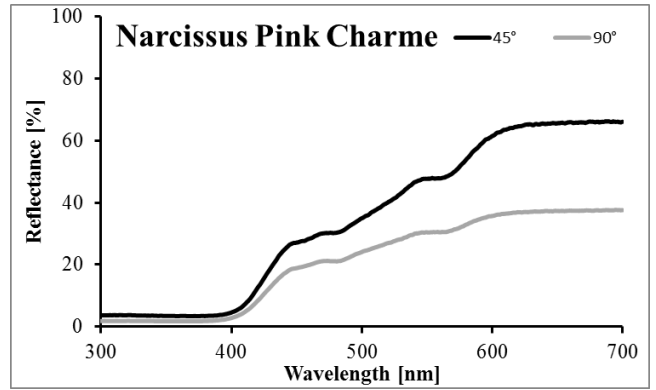
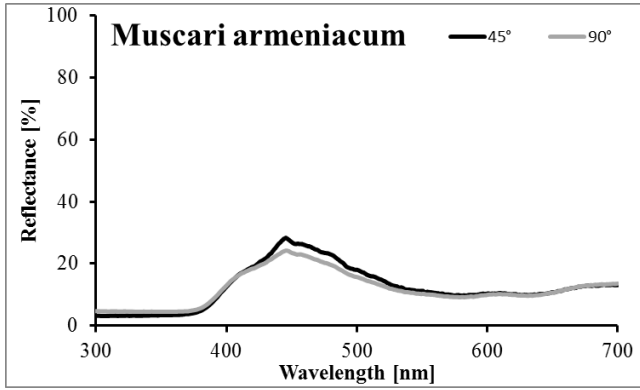
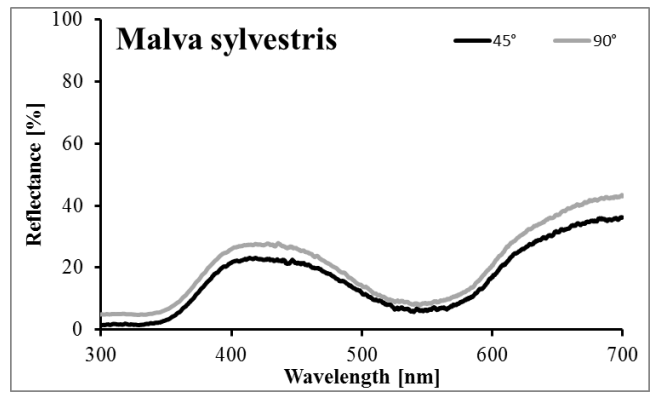
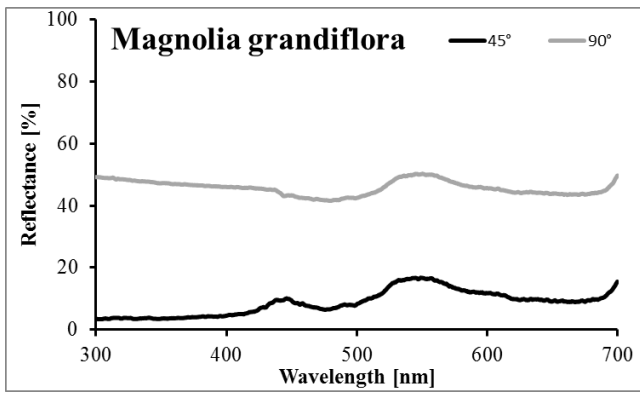


Fig. S3.4: Landing frequency of *Bombus terrestris* at vertically presented artificial flowers under spot light conditions when approaching in (left) and against (right) the direction of incident light. Abbreviations: Tconical = conical microtexture of upper side of *Tibouchina urvilleana* petal; Tsmooth = smooth microtexture of underside side of *Tibouchina urvilleana* petal; Msmooth = smooth microtexture of upper side of *Magnolia grandiflora* green leaf. Each of 10 bumblebees contributed 4 choices in each test. Statistics: P-values are given for each choice (Qui-Square test).







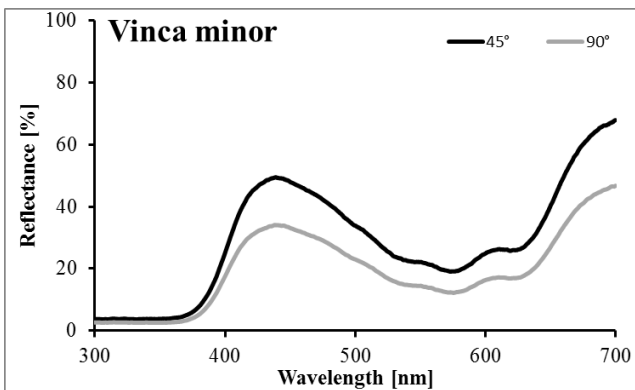
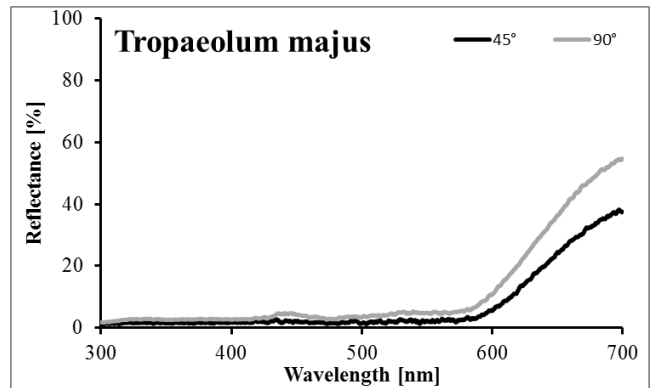
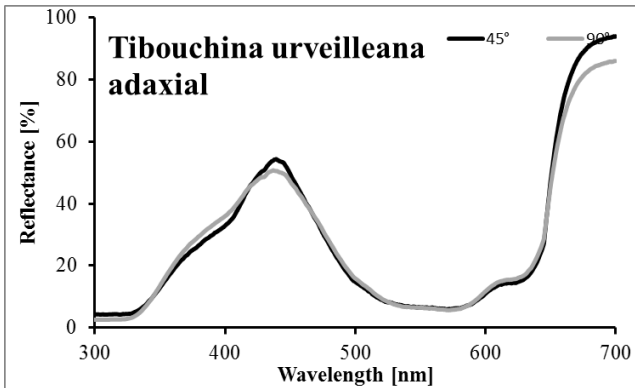
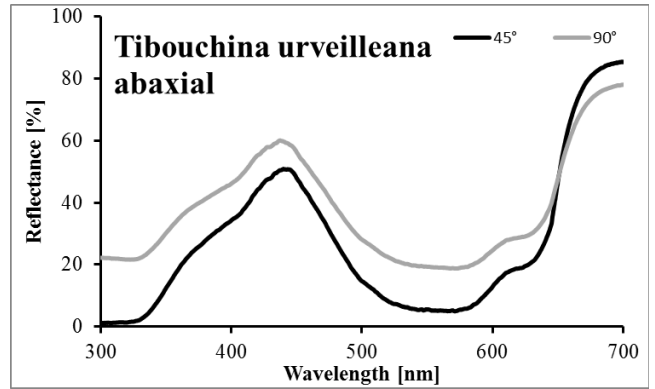
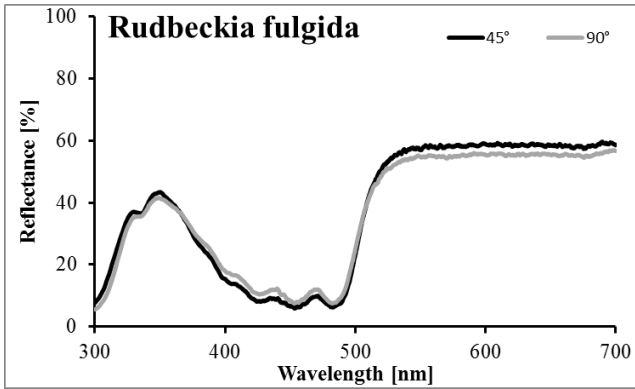
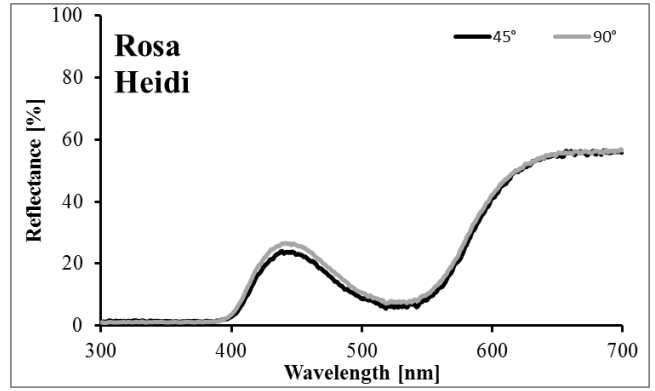
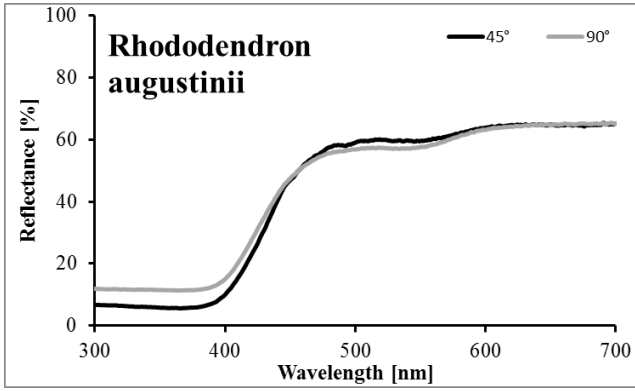
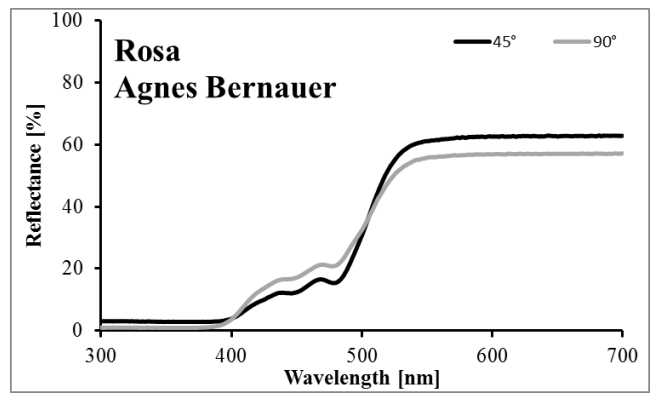
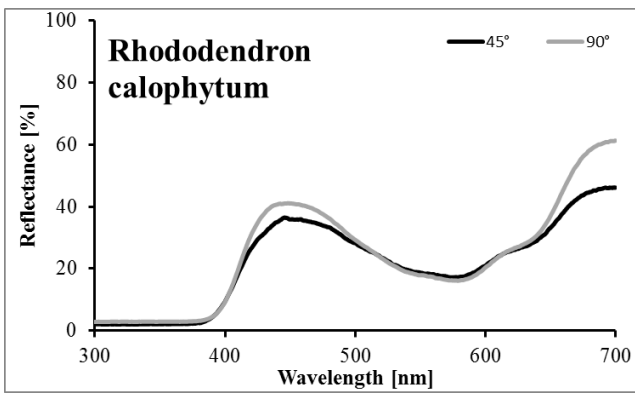


Fig. S4: Spectral reflectance of petals of the tested plant species under angles of 45° and 90°.

Table S1: Percentage of white pixels in digital photos of the artificial flowers taken under different light conditions and angles.

Light condition Camera angle	Rose petal	glass, rough large pellets	glass, fine small pellets	Smooth surface	<i>Tibouchina</i> petal, conical	<i>Tibouchina</i> petal, smooth	<i>Magnolia</i> green leaf, smooth
Diffuse 45°	0.11%	9.50%	4.75%	0.16%	0.02%	0.05%	0.37%
Diffuse 55°	0.08%	9.73%	5.31%	0.11%	0.05%	0.17%	0.28%
Diffuse 65°	0.13%	10.12%	6.02%	0.02%	0.02%	0.13%	0.35%
Diffuse 75°	0.12%	10.40%	6.87%	0.00%	0.03%	0.17%	0.29%
Diffuse 85°	0.11%	9.91%	6.10%	0.01%	0.04%	0.18%	0.32%
Diffuse 90°	0.17%	9.74%	6.65%	0.03%	0.03%	0.17%	0.21%
In Spotlight 45°	0.01%	5.00%	3.17%	0.08%	0.08%	0.09%	0.11%
In Spotlight 55°	0.02%	5.90%	4.03%	0.02%	0.00%	0.16%	0.08%
In Spotlight 65°	0.04%	6.58%	4.34%	0.10%	0.01%	0.20%	0.08%
In Spotlight 75°	0.01%	6.73%	4.47%	0.02%	0.00%	1.31%	0.08%
In Spotlight 85°	0.16%	7.57%	4.62%	0.08%	0.03%	1.40%	0.12%
In Spotlight 90°	0.15%	7.22%	4.59%	0.01%	0.01%	1.68%	0.09%
Against Spotlight 45°	0.90%	7.73%	11.38%	26.65%	0.10%	14.49%	51.48%
Against Spotlight 55°	0.64%	7.62%	10.46%	9.52%	0.14%	4.06%	28.94%
Against Spotlight 65°	0.52%	7.22%	11.41%	1.75%	0.16%	3.08%	11.06%
Against Spotlight 75°	0.55%	6.52%	7.35%	0.87%	0.03%	2.18%	3.74%
Against Spotlight 85°	0.39%	6.78%	6.23%	0.06%	0.02%	1.04%	3.03%
Against Spotlight 90°	0.02%	5.37%	4.63%	0.03%	0.12%	0.74%	0.06%

Table S2: Comparison between summarized responses of bumblebees and first responses of individual bumblebees.

Illumination & Presentation	Summarized results				First reactions			
	conical	rough	fine	smooth	conical	rough	fine	smooth
Diffuse illumination, vertical presentation	25 (38.5%)	24 (36.9%)	8 (12.3%)	7 (10.8%)	8 (50.0%)	6 (37.5%)	2 (12.5%)	0 (0%)
Diffuse illumination, horizontal presentation	23 (35.9%)	19 (29.7%)	16 (25.0%)	6 (9.4%)	7 (43.8%)	5 (31.3%)	2 (12.5%)	2 (12.5%)
Against spotlight illumination, horizontal presentation	13 (32.5%)	17 (42.5%)	6 (15.0%)	4 (10.0%)	6 (60.0%)	4 (40.0%)	0 (0%)	0 (0%)
In spotlight illumination, horizontal presentation	13 (32.5%)	12 (30.0%)	7 (17.5%)	8 (20.0%)	6 (60.0%)	1 (10.0%)	1 (10.0%)	2 (20.0%)